MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

BDS2074 – MANAGEMENT DECISION SCIENCE

(All Sections/Groups)

13 JULY 2023
9.00 a.m. - 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 printed pages excluding the cover page, with 4 questions only.

2. Attempt **ALL FOUR (4)** questions.

3. Students are allowed to use non-programmable scientific calculators (without restriction).

4. Please write all your answers in the Answer Booklet provided. All necessary workings **MUST** be shown.

QUESTION 1 [Total: 20 marks]

a) A manufacturer produces three types of detergents, Ky, Lo and Mi. Each type of detergent is produced using two machines, machine A and machine B. The following table gives the information on the usage of the machines.

Detergent	Machine A	Machine B
Ky	9	6
Lo	6	12
Mi	5	17

Due to the cost and manpower relationship, machine A must be used for at most 180 hours while the maximum capacity for machine B is 240 hours. The profit obtained from each unit of detergent Ky is RM53, from each unit of detergent Lo is RM62 and from each unit of detergent Mi is RM75. The manufacturer wishes to know the quantity of each type of detergent to be produced in order to maximize its profit.

(i) Formulate the problem above as a Linear Programming Model. [4 marks]

(ii) Set up the initial simplex tableau by including the necessary slack variables. [Do not solve until the final simplex table] [6 marks]

b) The optimal tableau for the above problem is given below, where x_1 is Detergent Ky, x_2 is Detergent Lo and x_3 is Detergent Mi, S_1 and S_2 are the slack variables for usage of Machine A and Machine B, respectively.

C_j →		53	62	75	0	0	
↓	**Solution Mix**	x_1	x_2	x_3	S_1	S_2	**Quantity**
53	x_1	1	0.3415	0	0.1382	-0.0407	15.122
75	x_3	0	0.5854	1	-0.0488	0.0732	8.7805
	Z_j	53	62	75	3.67	3.33	1460
	$C_j - Z_j$	0	0	0	-3.67	-3.33	

(i) State the optimal solution and the maximum profit. [4 marks]

(ii) Which of the constraint(s) are binding? Why? [3 marks]

(ii) If the cost required for an additional work hour for Machine B is RM4.50 per hour, is it worth acquiring additional units of this resource? Explain your answer. [3 marks]

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QUESTION 2 [Total: 32 marks]

a) Latifah produces crispy fish cakes in three plants A, B and C. It has three major customers X, Y and Z. The transportation cost per unit (in RM) from each plant to each destination are given in the table below:

	Customer X	Customer Y	Customer Z	Capacity
Plant A	5	4	6	35
Plant B	8	7	5	20
Plant C	6	5	8	15
Demand	30	16	24	

(i) Find the initial feasible solution using Northwest Corner method and the associated initial total shipping cost. [6 marks]

(ii) Find the optimal transportation schedule and cost using Stepping Stone method. [14 marks]

b) A consultant company has five consultants available to be assigned to five projects. The time, in hours, for each consultant for different projects are shown in the following table. Each project can be assigned to only one consultant.

Consultant	Project 1	Project 2	Project 3	Project 4	Project 5
Anne	60	25	64	50	78
Bernice	72	30	56	43	70
Cathy	68	28	66	60	80
Doris	70	29	55	54	75
Elly	75	32	62	45	10

Determine the optimal assignment using the Hungarian method. Then, compute the minimum total man-hours to complete all the projects. [12 marks]

Continued...

QUESTION 3 [Total: 23 marks]

Joe has a building project that consists of nine activities. The activities that must be accomplished in order to complete the project are listed as follows:

Activity	Weeks			Immediate Predecessors
	Optimistic time, *a*	Most likely time, *m*	Pessimistic time, *b*	
A	7	9	11	-
B	5	7	9	A
C	2	3	4	A
D	9	11	13	B
E	7	9	11	C, D
F	9	10	11	E
G	6	7	8	F
H	12	13	14	F
I	4	5	6	G, H

a) Construct a network diagram for this problem.

[7 marks]

b) Determine the expected time, variance, ES, EF, LS, LF and slack for each activity.

[9 marks]

c) Determine the critical path to complete the building project.

[2 marks]

d) What is the expected completion time of the building project?

[2 marks]

e) Calculate the variance of the building project.

[3 marks]

Continued...

QUESTION 4 [Total: 25 marks]

Mr. Chan, the manager of a commercial bank loan department, must decide on allocation of loans. He can choose strategy A, strategy B or not to provide any loan. The profit (RM) from each alternative depends on the economic conditions in the following table:

Alternative	Economic Condition, Profit (RM)		
	Good Economy	Average Economy	Poor Economy
Strategy A	265,000	125,000	30,000
Strategy B	400,000	190,000	-50,000
No loan	0	0	0

a) Determine the best investment using the following decision criteria:

(i) Maximax [3 marks]

(ii) Maximin [3 marks]

(iii) Equally likely criterion [4 marks]

(iv) Criterion of realism, using $\alpha = 0.6$ [4 marks]

(v) Minimax regret criterion [5 marks]

b) Based from the above table provided, Mr. Chan estimates the probabilities of good market, average market and poor market are 0.4, 0.5 and 0.1 respectively.

(i) Construct an expected opportunity loss (EOL) table. [4 marks]

(ii) Determine the best decision using minimum EOL as the decision criterion. [2 marks]

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